Kenai River Salmon . . . a Unique Resource in South-central Alaska

FISH AND WILDLIFE LEAFLETS

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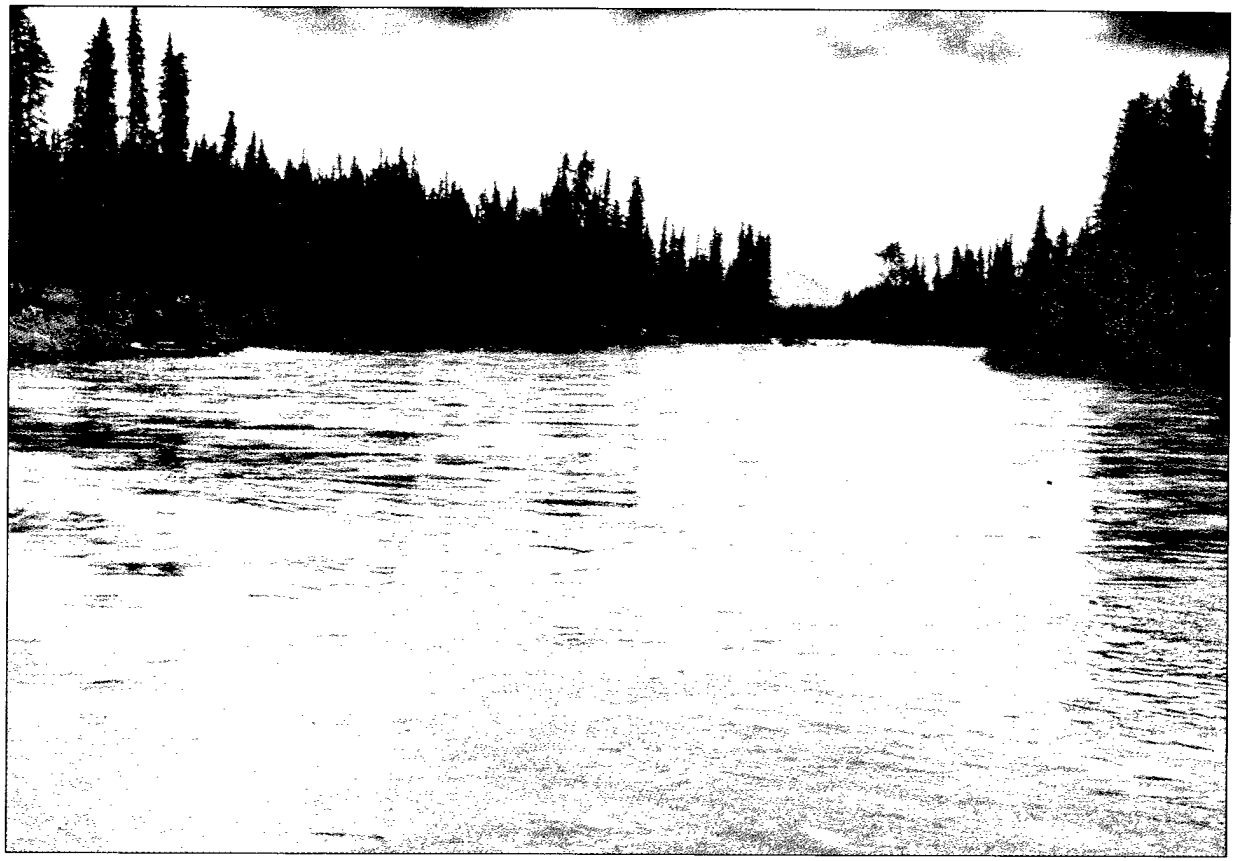

Kenai River Salmon . . . a Unique Resource in South-central Alaska

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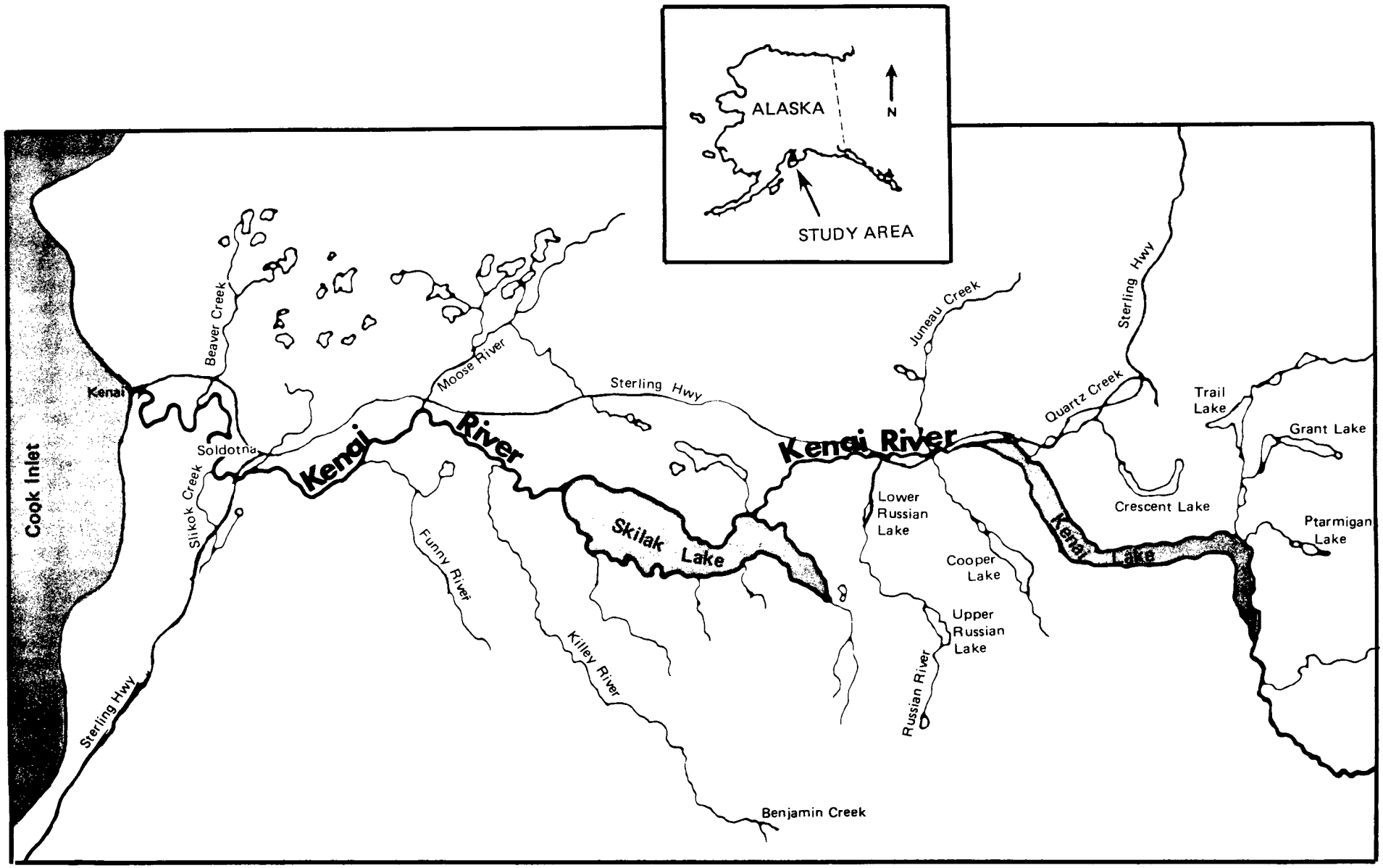

ALASKA
N
STUDY AREA
Cook Inlet
Kenai
Beaver Creek
Soldotna
Slikok Creek
Moose River
Sterling Hwy
Kenai River
Skilak Lake
Funny River
Killey River
Benjamin Creek
Sterling Hwy
Juneau Creek
Quartz Creek
Sterling Hwy
Kenai River
Lower Russian Lake
Cooper Lake
Upper Russian Lake
Russian River
Kenai Lake
Crescent Lake
Trail Lake
Grant Lake
Ptarmigan Lake

The Kenai . . . kings are king

The Kenai River is the most heavily used sport fishing river in Alaska. The main river and its tributaries support multiple runs of salmon—king, silver and red—a unique occurrence in south-central Alaska.[1] The river also supports pink salmon, rainbow trout, Dolly Varden, and other fishes.

King salmon are probably the most sought-after recreational resource in the river. Every year, anglers from all over the globe are drawn to the Kenai in quest of the world's largest salmon, the Kenai king. The Kenai River is also a major producer for the Cook Inlet commercial fishery.

Annual studies of the Alaska Department of Fish and Game were the first to suggest the existence of two runs of kings in the Kenai River. Primarily because of these two runs of kings (and two runs of silvers), public use of the river, including sport fishing and guiding activities, has risen dramatically since the 1970s.

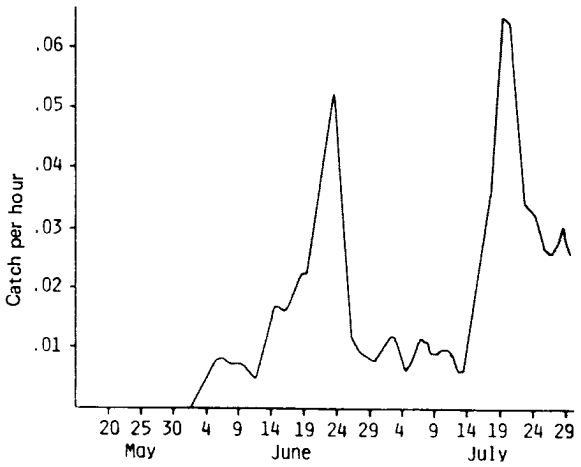
Recognizing the importance of maintaining and protecting this area of abundant fishery

The confluence of the Moose and Kenai rivers is a popular recreation area for anglers fishing for king and red salmon.

The Kenai's two runs of king salmon are probably the most sought-after recreational resource on the river.

[1]Common names recommended by the American Fisheries Society for king, silver, and red salmon are (respectively), chinook, coho, and sockeye salmon.

When king runs peak



Graph shows king salmon catch per hour during the Kenai River sport fishing season, 1980. Data were obtained by the Alaska Department of Fish and Game, which has recently initiated new tagging studies on Kenai king salmon.

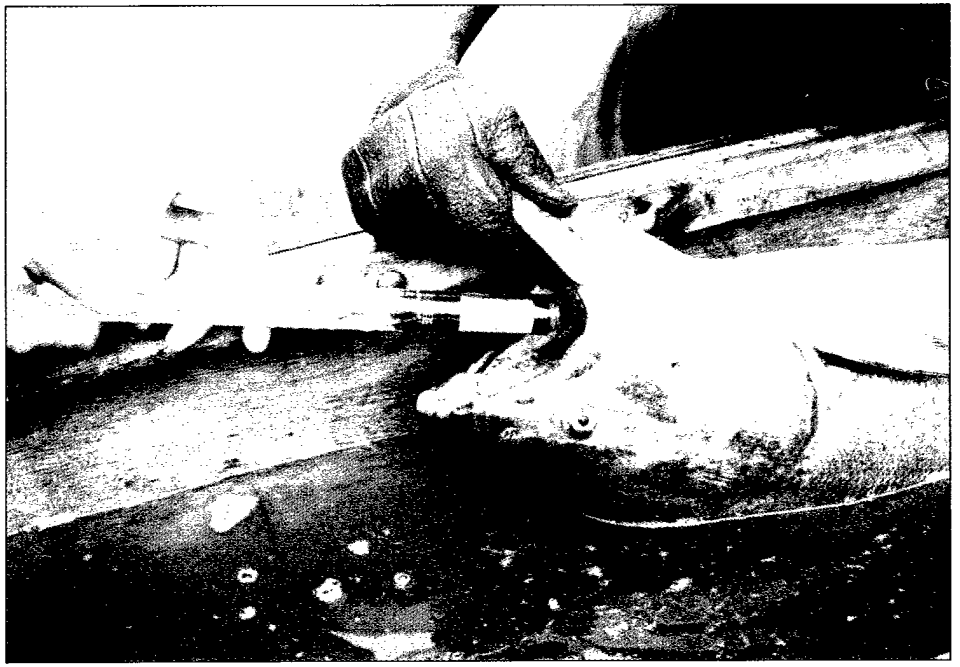
Researchers used backpack electrofishers to pulse electricity into the water and capture juvenile salmon. Other capture techniques included the use of seines and minnow traps.

resources, the State of Alaska in 1984 created the Kenai River Special Management Area to protect and perpetuate fish and wildlife resources on the Kenai River and in adjacent areas.

The U.S. Fish and Wildlife Service (USFWS), an active member of the Advisory Board for the Kenai River Special Management Area, has been studying Kenai River resources for several years in cooperation with the Alaska Department of Fish and Game and other resource agencies. As manager of the Kenai National Wildlife Refuge, USFWS is responsible for all activities and resources on the refuge, much of which is in the Kenai River drainage area. In addition, USFWS serves as an advisor to the U.S. Army Corps of Engineers in identifying impacts of proposed actions on fish and wildlife, and in identifying mitigation and enhancement opportunities.

Research on salmon spawning and rearing areas in the Kenai River was conducted by the Seattle National Fishery Research Center, USFWS, from 1979 to 1982. This summary of research findings is intended to provide an understanding of how the Kenai River and its tributary systems and associated wetlands satisfy the important life history requirements of the salmon they support.

Habitat . . . key to Kenai fishery



Transmitters inserted into the stomachs of king salmon helped researchers confirm the existence of two separate runs of Kenai kings.

Wetlands, slow-moving tributaries, deep pools, graveled river bottoms, bank vegetation, and the fast-running main stem of the Kenai River itself—each of these plays a part in the unique habitat of the Kenai.

Continued production of Kenai River salmon cannot be ensured if the habitat that supports them is lost.

Wetlands, slow-moving tributaries, deep pools, graveled river bottoms, bank vegetation, and the fast-running main stem of the Kenai River itself—each of these plays a part in the unique habitat of the Kenai, and each satisfies a portion of the life requirements (reproduction, food, and shelter) of Kenai River salmon.

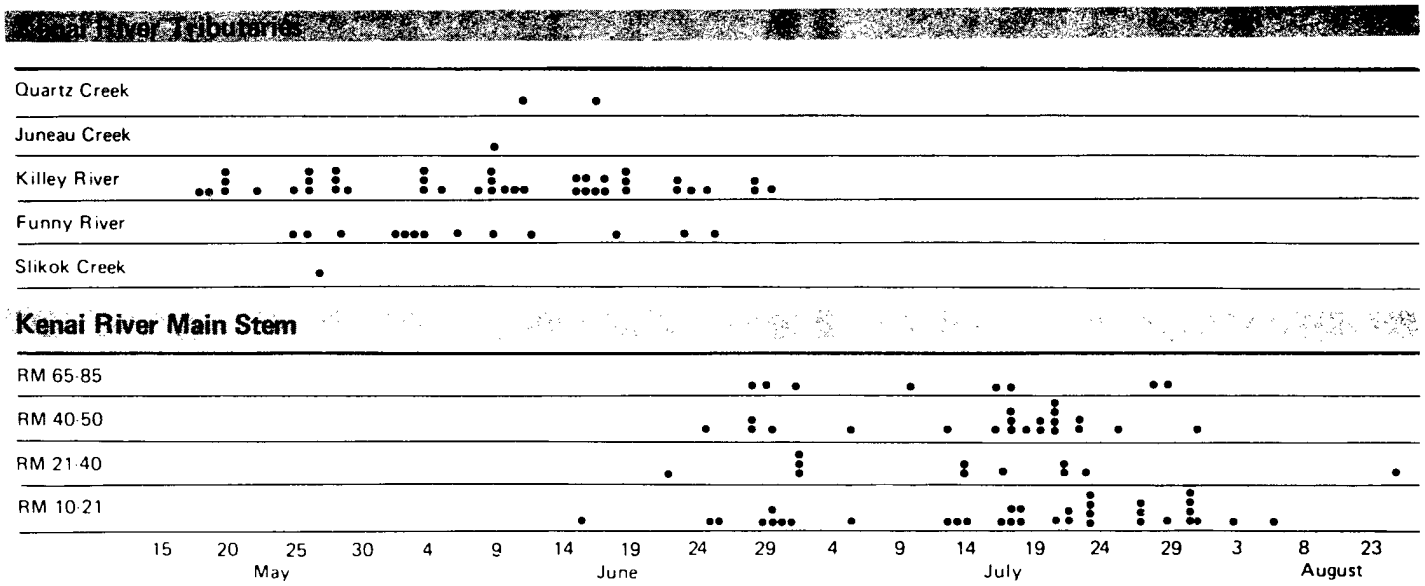
USFWS investigations have identified some of the characteristics and requirements of the Kenai's varied salmon population.

A host of techniques ranging from SCUBA observations to low-flow surveys were used to locate salmon spawning grounds in the Kenai River. The most successful methods involved radiotelemetry. Four-inch transmitters were inserted into the stomachs of 188 Kenai king salmon, and the fish were then radio-tracked to spawning areas.

USFWS studies confirmed that king salmon have two distinct spawning runs in the Kenai. The early run enters the Kenai River in May and June and spawns primarily in tributaries. Of 59 early-run salmon tracked to tributaries in 1980–1982, 71% migrated into the Killey River and 22% entered the Funny River. The studies showed that the late run enters the river from late June through August and spawns in the main stem of the Kenai River, primarily from River Mile (RM) 40 to 50 in the upper river, and from RM 10 to 21 in the lower river. Of 75 late-run salmon radio-tracked to main-stem spawning areas in 1979 to 1981, 47% spawned in the lower

Where kings spawn

King salmon have two distinct spawning runs in the Kenai.



Graph shows the final destination of radio-tagged king salmon and the date they were tagged and released in the Kenai River and its tributaries from 1979 to 1982. Generally, fish bound for tributaries were those tagged during May and June, while salmon destined for the main stem were those tagged from late June through August. (Skilak Lake, RM 50 to 60, is not represented because king salmon did not spawn there.)

river (RM 10 to 21) and 28% spawned in the river below Skilak Lake (RM 40 to 50). These percentages varied from year to year. The high percentage of lower river spawners may have been due, in part, to fish capture location (RM 12.5).

Radio tagging showed that early-run king salmon migrate faster than late-run fish. The slower movement rates of late-run salmon probably reflect the fact that these fish are on the spawning grounds soon after entering the main-stem Kenai River. Typical migration rates through the main-stem sport fishing area ranged from 4 to 8 miles per day. The farthest distance traveled by a radio-tagged fish in a 24-hour period was 18 miles. Fish were most active from late afternoon through early evening.

Netted king salmon were anesthetized for insertion of transmitter, then hand-held in shallow water until they could swim away.

Hand-held antennas enabled researchers to track radio-tagged fish to their spawning grounds.

Areas where spawning occurs generally have low gradients and more meanders and brush- or grass-covered islands than other parts of the river.

Radio-tagging studies also showed that early-run fish are either in a tributary stream or above Skilak Lake (areas closed to fishing) by early July, when sport fishing begins in the main stem for late-run salmon.

Although most of the research by USFWS on adult fish concentrated on king salmon, limited radio-tagging studies suggest that the runs of silver salmon entering the Kenai also spawn in the tributaries (early run) and in the main stem (late run). Most, if not all, main-stem spawning by silvers occurs above RM 40. A high-use spawning area occurs from RM 45 to 50, just below Skilak Lake, where kings, silvers, reds, and rainbow trout spawn.

Areas where spawning occurs generally have low gradients and more meanders and brush- or grass-covered islands than other parts of the river. Redds, the nests females dig for their eggs, are usually at the upstream tips of vegetated islands in loose, clean gravel. Studies showed few redds near developed areas. In spawning areas upstream of Poacher's Cove (RM 17.1), king salmon eggs were buried as deep as 30 inches.

Spawning times were determined for radio-tagged king salmon in each run. Early-run fish spawned in the Killey and Funny rivers in July, but in several other tributary streams spawning peaked in August. An interesting observation is that the Killey and Funny rivers have no lakes at their sources, while tributaries used by the August-spawning fish flow from lakes. Sun-warmed lake waters increase stream temperatures so that spawning can occur later in lake-fed tributaries.

The late run of king salmon spawns in mid-August in the Kenai River main stem. Two large lakes—Kenai and Skilak—directly influence the Kenai River. These lakes probably warm the drainage and are therefore a likely explanation for the existence of the unique late run of kings in the Kenai River. Thus, the spawning times of the early- and late-run kings are adapted for specific spawning environments. If this explanation is correct, salmon may be more susceptible to activities that alter stream temperatures than was previously suspected.

King salmon eggs are sometimes buried as deep as 30 inches.

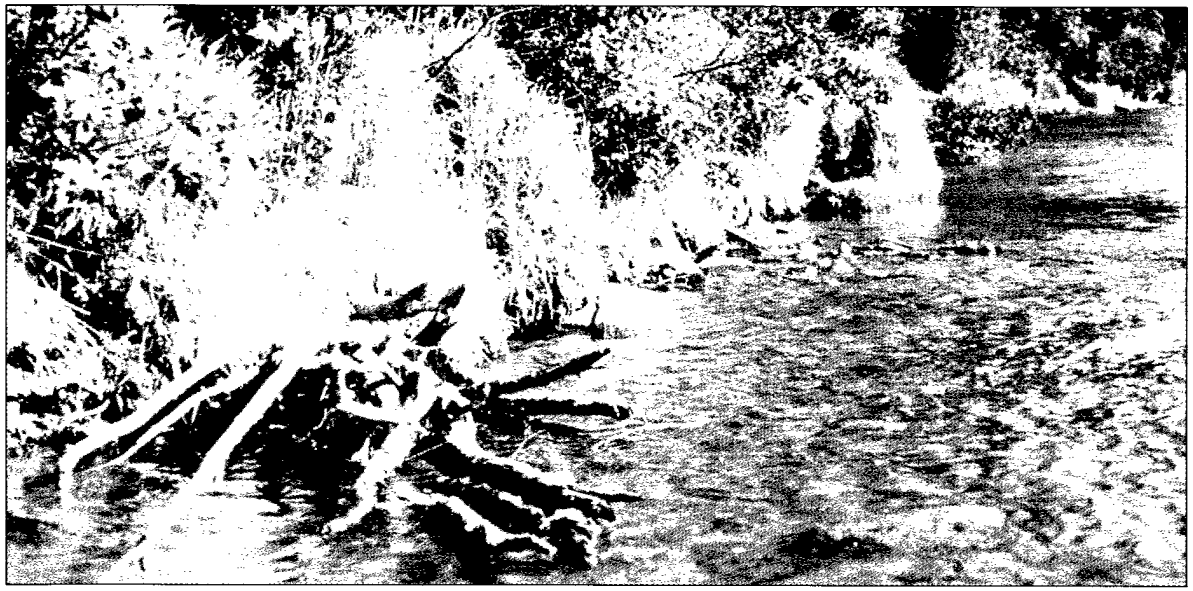
Irregular banks . . . necessity for juvenile salmon

During research studies, about 40 sites in the Kenai River main stem were sampled up to 5 times each summer to determine the habitat preferences of juvenile salmon. Velocity of river water and depth and composition of riverbed gravels were measured. Sampling techniques included the use of baited minnow traps, beach seines, and backpack electrofishers; locations of juvenile fish were directly observed by SCUBA divers.

The most significant finding was that more than 80% of the juveniles sampled were found within about 6 feet of the river banks in relatively shallow water near undisturbed areas. The protection of these banks is thus one of the keys to continued productivity.

Generally, young king salmon in the Kenai and its tributaries emerge from the gravel during mid-April to June, and immediately seek pools and slow-flowing areas along river banks. Most stay in the river or its tributaries for a year, feeding on insects and other drift food items before migrating to Cook Inlet the following spring.

Over 80% of the juvenile salmon sampled were found within 6 feet of the river banks in relatively shallow water near undisturbed areas.



Juvenile salmon stay in the Kenai and its tributaries 1 to 3 years, feeding on drifting insects and organic particles. They prefer habitat along undisturbed riverbanks.

The Kenai River's natural, irregular banks are a necessity for juvenile king salmon during periods of high water. Bank irregularities form small pools and eddies, and zones of optimum water-velocity are created downstream from these irregularities. Channelized banks, and banks that have been altered from their natural state, often result in smooth profiles that increase water velocities beyond the usable limit of juvenile kings.

Observations suggest that some juvenile kings move upstream in winter to the middle river (RM 21 to 40), where large gravel and boulders presumably offer protection. As documented by research in other rivers, juvenile salmon stay close to graveled riverbeds during winter, occasionally burrowing into the gravel to conserve energy.

Juvenile silvers, which emerge about a month later than late-run kings, prefer slower flowing waters than kings and spend up to 3 years in freshwater. The juvenile silvers prefer shallow tributaries where they can simultaneously feed and hide in a "familiar" territory, which they defend. Many juveniles are found close to riverbanks, often in areas where the stream has flooded the bank vegetation. Juvenile silvers are typically found in creek mouths, backwater pools, and man-made canals where depths rarely exceed 4 feet.

Slow, shallow pools are favored by juvenile silvers, which stay in the Kenai River and its tributaries for as long as 3 years.

The Kenai River's natural, irregular banks are a necessity for juvenile king salmon during periods of high water.

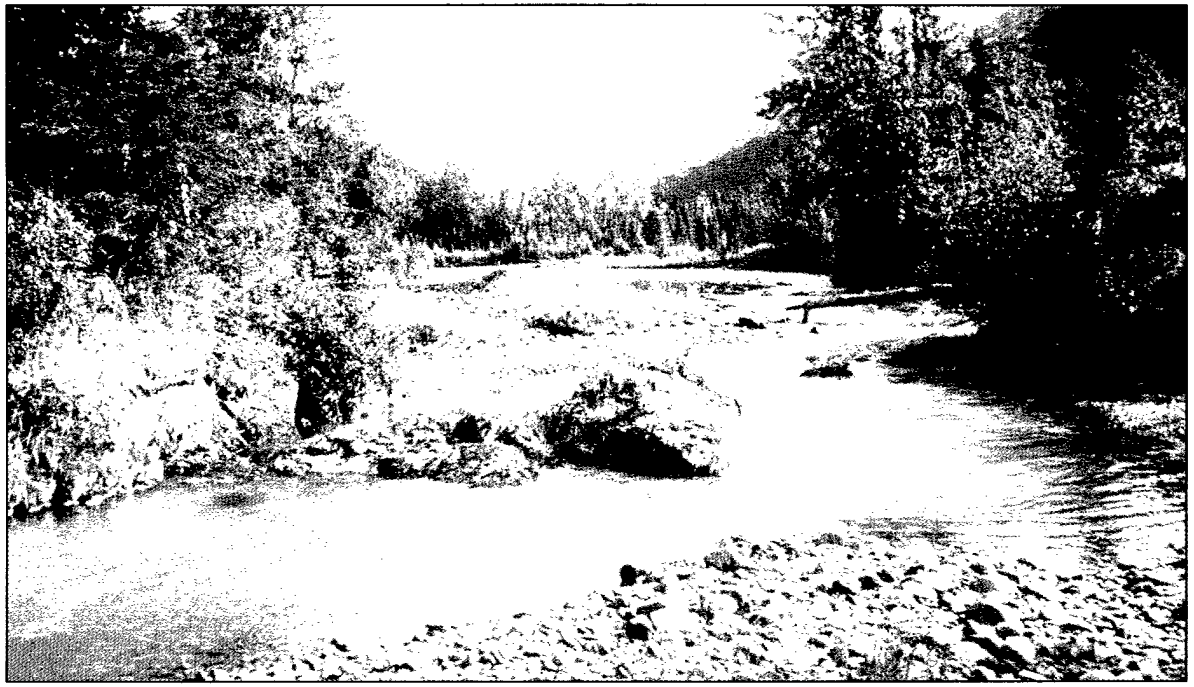
Kenai and tributaries . . . interdependent

Drifting insects and fine organic particles enter the streams from numerous wetland drainages, providing additional nutrients for juvenile salmon.

The complex, interdependent role of the Kenai and its tributary streams and wetlands cannot be overemphasized. For example, some streams have little or no spawning potential. Yet, these streams may provide rearing space for fish that were spawned in other parts of the Kenai River drainage.

Other USFWS researchers found that production of young silver salmon in Slikok Creek exceeds the ability of that stream to support them. Beaver Creek, on the other hand, appears to provide rearing habitat not only for offspring of silvers that spawned there, but also for juveniles that emigrate from other spawning areas in the Kenai River drainage.

Surface and underground water flow from numerous wetland drainages enhances stream flows in the Kenai River and its tributaries. Drifting insects and fine organic particles enter the streams with this flow, providing additional nutrients for juvenile salmon.

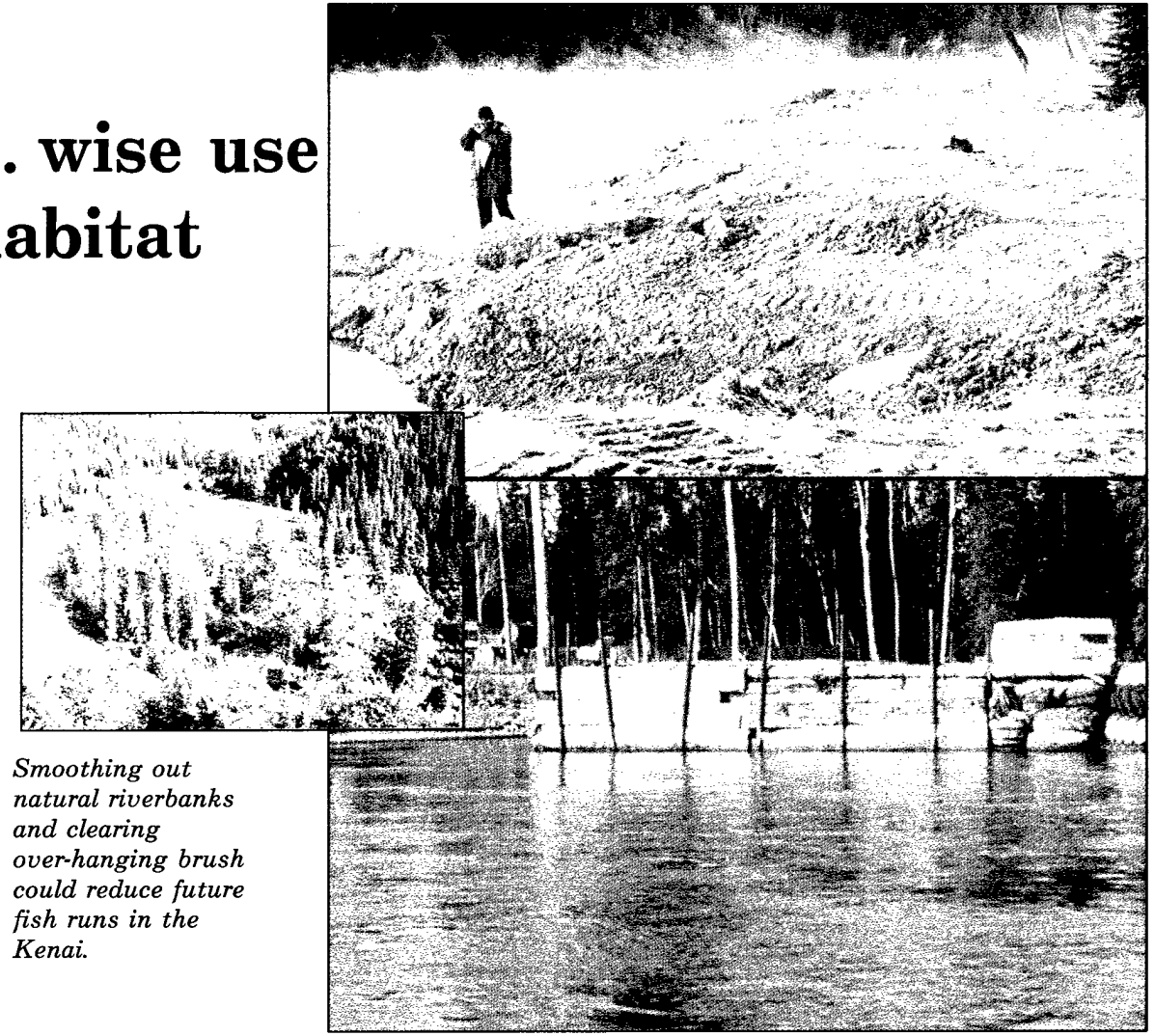


Juvenile silver salmon also live in shallow tributaries where they can simultaneously feed, defend their position, and hide in "familiar" territory.

The challenge . . . wise use to safeguard habitat

Certain human uses and activities on the Kenai River and the surrounding river basin could reduce its overall fish productivity.

Channel excavations that remove natural banks affect the habitat of juvenile king salmon. Basin or canal construction replaces the numerous small pools found along irregular banks with a single large pool. Although the backwater pool created by this type of excavation provides some habitat for juvenile silver and red salmon and Dolly Varden, most such pools do not offer year-round habitat, and the resulting velocities are not those preferred by juvenile kings. Most basins and canals dewater in the fall and displace all of their summer fish production into the "shrinking" main channel of the Kenai River.



Smoothing out natural riverbanks and clearing over-hanging brush could reduce future fish runs in the Kenai.

Natural, unaltered banks are preferred by juvenile salmon.

Juvenile king salmon avoid areas where water currents have either been eliminated or are too fast.

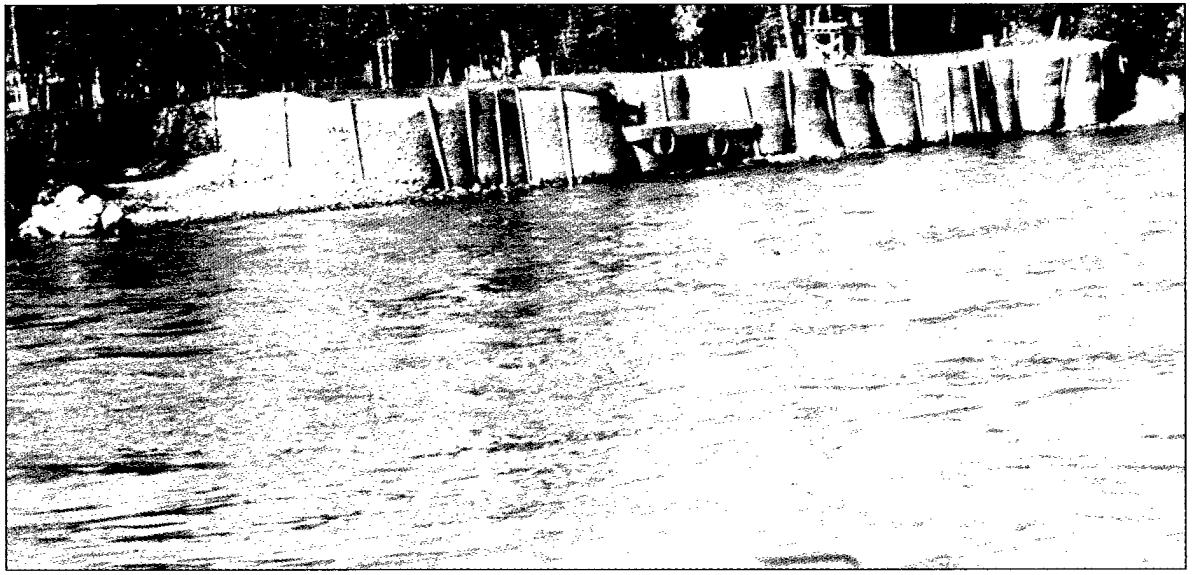
The addition of a structure perpendicular to the river channel, such as a jetty, alters natural flows above and below the structure by creating large pools that are not used by juvenile kings. Also, water velocities at the tips of these structures increase, further decreasing the desirability of the habitat.

Juvenile king salmon avoid areas without current, as well as those where velocities are too fast (as at the tip of a jetty). Short rock jetties cause less habitat damage than other man-made alterations because these jetties are permeable and allow some water flow.

The frequent result of erosion control projects is to eliminate the irregular nature of the bank. These altered sections of the Kenai River increase water velocity along the bank and decrease usable habitat for juvenile salmon.

Riverbank development usually occurs because the landowner wants to enhance his property for summertime recreation. This is the same period during which juvenile king salmon require an "irregular" bank habitat. Summertime catch rates are greater in undeveloped sections of the Kenai River, biologists have found.

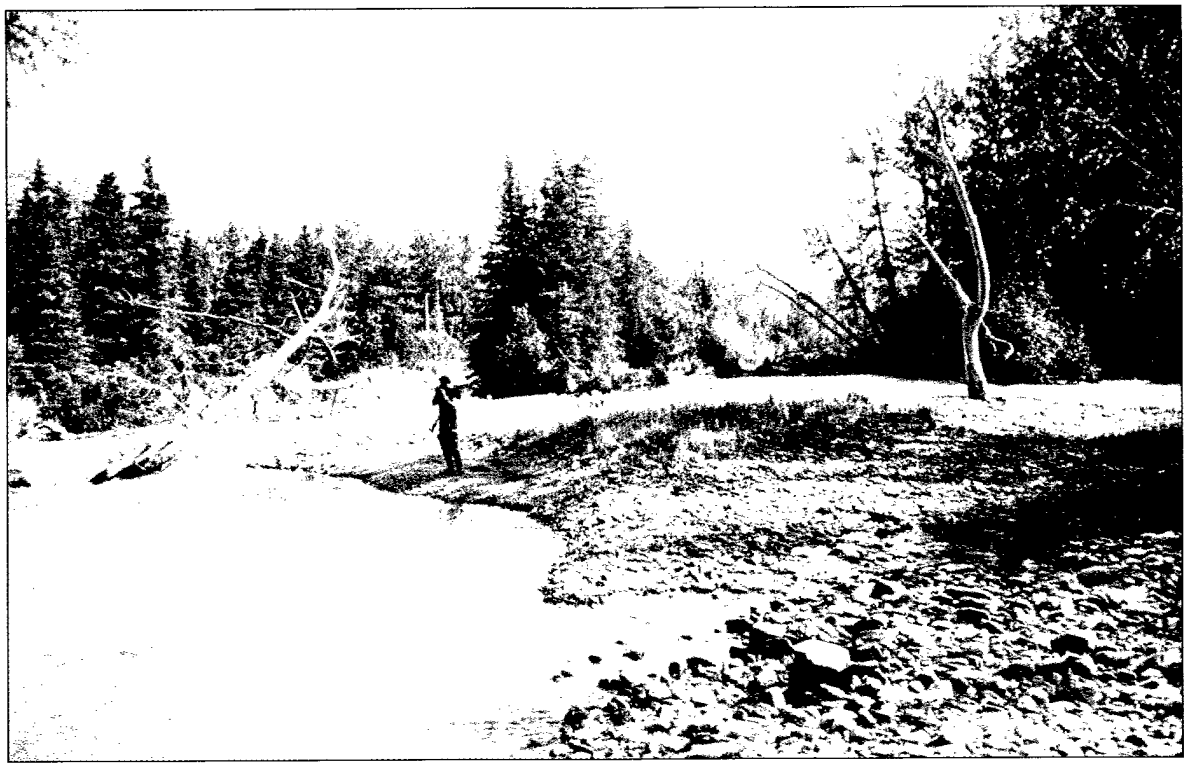
One significant man-made impediment to the rearing and/or spawning potential of



Various techniques have been used along the Kenai River to attempt to control bank erosion.

Altered sections of the Kenai River increase water velocity along the bank and decrease usable habitat for juvenile salmon.

streams is the improper placement of culverts that allow flows to pass under highways. Culverts that are not placed properly can create a barrier to movement by salmon. The water flowing through the culvert may be too swift, thus blocking fish passage.



Studies showed higher counts of juvenile salmon in undeveloped sections of the Kenai and its tributaries than in developed areas.

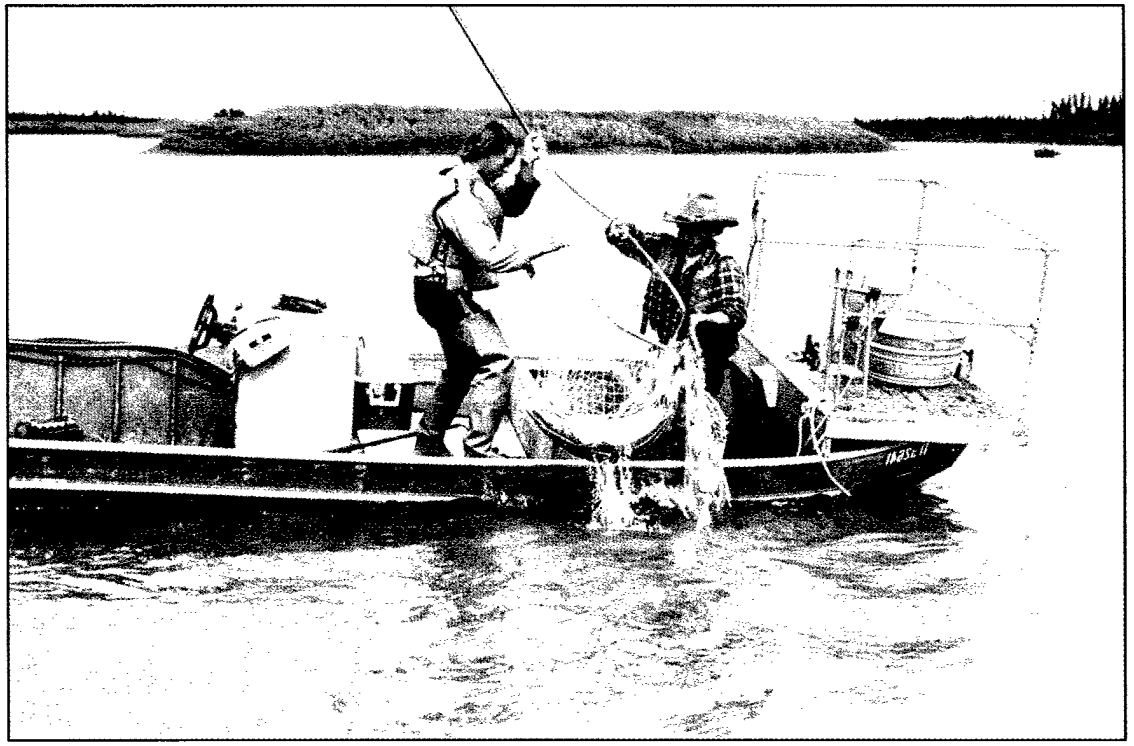
Kenai studies lead to awareness

Although much work has been done during the past several years on the Kenai River and its salmon-rich habitat, more information should be obtained to better understand the habitat requirements of these fish.

Juvenile king salmon populations should be quantified, and origins should be determined. While the main-stem river provides spawning habitat for only one run of king salmon (the late run), do juveniles from both runs rear in the Kenai River?

Some displacement of 6-month old king salmon into Cook Inlet (an atypical event) was suggested in these studies. Are these fish prematurely "lost" to the estuary because of competition and limited rearing habitat in the main stem?

Specific sites should be studied to compare natural and altered river banks. More detailed information is required to document the types of developments that are least harmful to salmon.



Small-mesh gill nets were drifted downstream in the lower Kenai River to capture adult king salmon for radio tagging. The mesh was too small to ensnare king salmon by the gills, but entangled these large fish by their teeth and jaws.

More detailed information is required to document the types of developments that are least harmful to salmon.

If, as hypothesized, the multiple runs of king, silver, and red salmon are adapted to specific spawning areas in tributaries and in the main stem because of water temperatures, any activities of man that alter stream temperatures (or spawning times of these fish) may have an impact on spawning success. Studies should be undertaken to further evaluate this hypothesis.

SCUBA was used to collect data on fish behavior, habitat use by juvenile fish, and spawning areas.

Size of riverbed gravels and the depth to which gravels were embedded were studied to determine preferences of juvenile salmon and the spawning habitat requirements of adults.

Acknowledgments

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For more information about these Kenai River studies, please contact Carl V. Burger, U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, AK 99503; (907) 786-3314.

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